STATE HIGHWAY COMMISSION
HELENA, MONTANA 59601

MARCH 1, 1969

M E M O R A N D U M

TO: ALL DISTRICT ENGINEERS, DEPARTMENT AND SECTION HEADS

FROM: MELVIN C. RYGG, OFFICE ENGINEER

SUBJECT: FIELD & OFFICE STANDARD DRAWINGS

Please replace Drawings Nos. 22, 23, 24 and 31 of your Field and Office Standard Book with these revised drawings marked effective March 1, 1969. A revised page one of the index is also included.

Melvin C. Rygg

MCR/JJMcC/bc

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NOTE: Omitted page numbers are for assignment to contemplated future standards

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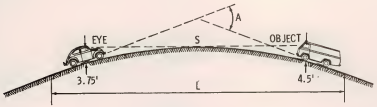
EFFECTIVE DATE	8-1-61 3-1-69	STANDARD SHEET NO. 22
State Highway Commission Helena, Montana	PASSING SIGHT DISTANCE FOR CREST VERTICAL CURVES	Approved James J. Wilson 2-20-69 State Highway Engineer



FORMULAS:

WHEN S IS LESS THAN L

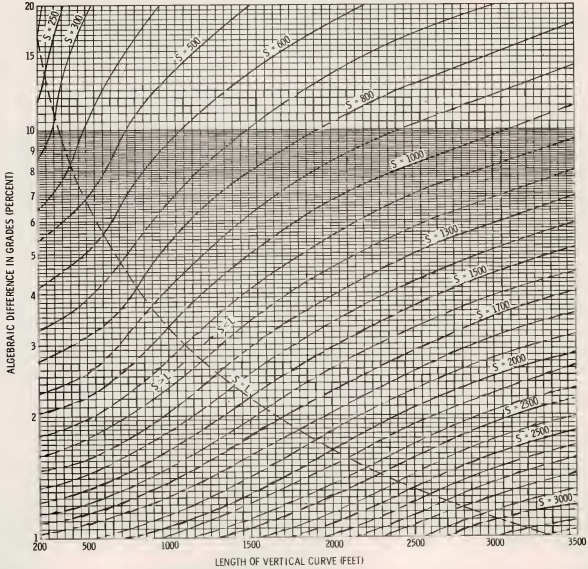
$$L = \frac{AS^2}{3295}$$

WHEN S IS GREATER THAN L

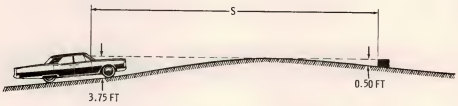
$$L = 2S - \frac{3295}{A}$$

S = SIGHT DISTANCE IN FEET
L = LENGTH OF VERTICAL CURVE IN FEET
A = ALGEBRAIC DIFFERENCE OF GRADES IN PERCENT

DESIGN SPEED (MPH)	25	30	35	40	50	60	70	80
MIN PASSING S.D. (FT)	800	1100	1300	1500	1800	2100	2500	2700



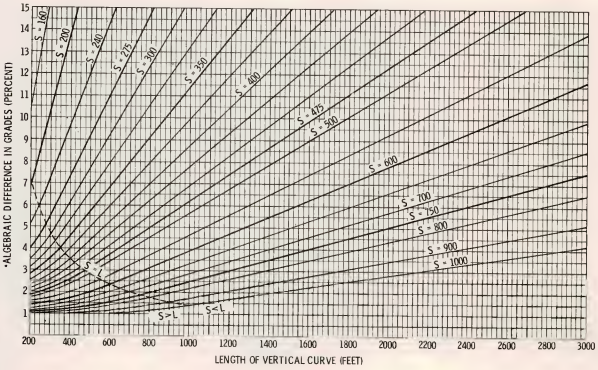
EFFECTIVE DATES	8-1-61 3-1-69	STANDARD SHEET NO. 23
State Highway Commission Helena, Montana	STOPPING SIGHT DISTANCE ON CREST VERTICAL CURVES	Approved State Highway Engineer



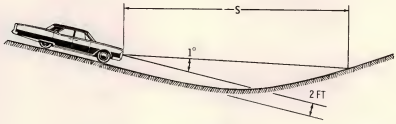
WHEN S > L	WHEN S < L
$L = 2S - \frac{1398}{A}$	$L = \frac{AS^2}{1398}$

L = CURVE LENGTH (FEET)
A = ALGEBRAIC GRADE DIFFERENCE (PERCENT)
S = SIGHT DISTANCE (FEET)

DESIGN SPEED (MPH)	MINIMUM STOPPING DISTANCE (FEET)	DESIRABLE MIN. STOPPING DISTANCE (FEET)
25	160	200
30	200	240
35	240	275
40	275	350
50	350	475
60	475	600
70	600	750
80	750	900



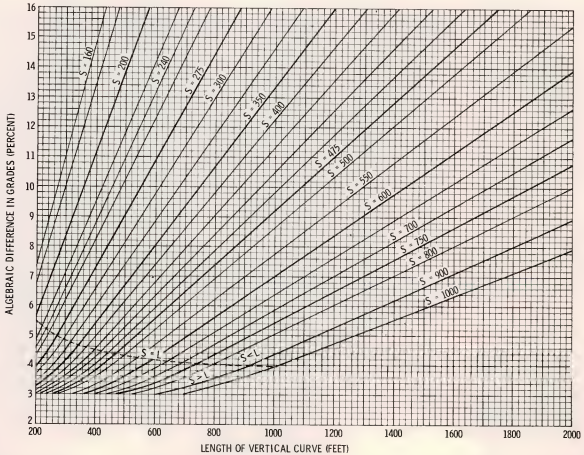
EFFECTIVE DATES	1-1-59 3-1-69	STANDARD SHEET NO. 24
State Highway Commission Helena, Montana	STOPPING SIGHT DISTANCE ON SAG VERTICAL CURVES	Approved Louis McCulloch State Highway Engineer



WHEN S > L	WHEN S < L
$L = 2S - \frac{400 + 3.5S}{A}$	$L = \frac{AS^2}{400 + 3.5S}$

L = CURVE LENGTH (FEET)
A = ALGEBRAIC GRADE DIFFERENCE (PERCENT)
S = SIGHT DISTANCE (FEET)

DESIGN SPEED (MPH)	MINIMUM STOPPING DISTANCE (FEET)	DESIRABLE MIN STOPPING DISTANCE (FEET)
25	160	200
30	200	240
35	240	275
40	275	350
50	350	475
60	475	600
70	600	750
80	750	900



EFFECTIVE DATES	11-1-66	3-1-69	STANDARD SHEET NO. 31
	12-1-67		

State Highway Commission
Helena, Montana

PRIMARY & SECONDARY
DESIGN STANDARDS

Approved James W. Carlton 2/28/67
State Highway Engineer

CUT SLOPES

Cut Depth at Slope Stake	Level Terrain	Rolling Terrain	Mountain Terrain	*Solid Rock
0' - 5'	5:1	5:1	5:1	
5' -10'	4:1	4:1	3:1	SEE STANDARD
10' -15'	3:1	3:1	2:1	SHEET NO. 39
15' -20'	2:1	2:1	1½:1	
Over 20'	1½:1	1½:1	1:1	

Transition slopes shall be provided between adjoining cuts and fills

FILL SLOPES

*Fill Depth at Slope Stake	Level Terrain		Rolling Terrain		Mountain Terrain		Rock
	Minim	Prefer	Minim	Prefer	Minim	Prefer	
0' - 5'	6:1	6:1	6:1	6:1	6:1	6:1	
5' -10'	4:1	6:1	4:1	6:1	4:1	6:1	
10' -15'	3:1	4:1	3:1	4:1	3:1	4:1	1½:1
15' -20'	2:1	4:1	2:1	4:1	2:1	4:1	1½:1
Over 20'	1½:1	2:1	1½:1	2:1	1½:1	2:1	1½:1

*See note on Std. Sheet #32

**See note on Border

MINIMUM VERTICAL CURVE LENGTHS

Terrain / Design Speed		Level 70 mph	Rolling 60 mph	Mountain 50 mph
STOPPING SIGHT DISTANCE	Stopping Distance, Ft.	600	475	350
	Crest Vertical Curve	2.55	1.60	0.85
	Sag Vertical Curve	1.45	1.05	0.75
PASSING SIGHT DISTANCE	Passing Distance, Ft.	2500	2100	1800
	Crest Vertical Curve	18.95	13.40	9.85

*Values given are coefficient by which the algebraic difference in grade may be multiplied to determine the length in Sta's of the vert. curve which will provide minimum sight distance. Special design where higher standards are not feasible. Subject to prior app. of Hdgtrs.

MAXIMUM GRADES & HORIZONTAL CURVES

	Level Terrain Design Speed 70 mph	Rolling Terrain Design Speed 60 mph	Mountain Terrain Design Speed 50 mph	Special Design @
Maximum Grade	3%	5%	6%	7%
Max. Horiz. Curve	3°30'	5°00'	7°30'	12°30'

@ Special design where higher stds. are not feasible. Subject to prior approval of headquarters.

ROAD WIDTHS

Future ADT *20 yr.	PRIMARY & SECONDARY MINIMUM WIDTHS		
	Mountainous 50 mph	Rolling 60 mph	Level 70 mph
0-100	26	26	26
100-450	28	28	28
450-700	28	30	30
700-1400	34	34	36
1400-2800	40	40	40
Over 2800	44	44	44

Primary & Secondary Roads with future traffic volumes of 100 ADT or more to be Bit.-Surf. Low volume rds. are considered to be those having less than 100 ADT future traffic counts.

*In some case, traffic vol. may be given as design hourly volume (DHV) in such cases DHV X 7 = ADT

NOTE: Refer to Std. Sht. #20 for super elevations and curve widening.
See Std. Sheet #30 or #32 for Interstate Standards.

**NOTE: Less than "Preferred Design" standards are to be used only where their application would result in extremely high cost.
The use of 1½:1 slopes require prior analysis of slope stability.